

Ops Concept Update

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Plan for Report

- Updated ops con will be shown here – any changes need to be made now, then it will go into the report.
 - This will be substituted in for the 3/15 version.
 - Will include a couple coronagraph plots.
- Further work will be deferred to after the report:
 - Update coronagraph constraints from WAG (current).
 - Correctly schedule SN follow up observations.
 - Current plan has the right amount of time, but e.g. the reference spectroscopy is not scheduled after the SN has completely faded – these are straightforward to fix and have no impact on mission performance, but will take time.
 - Miscellaneous (optimization of footprint, robustness to interruptions, etc.)

General Comments

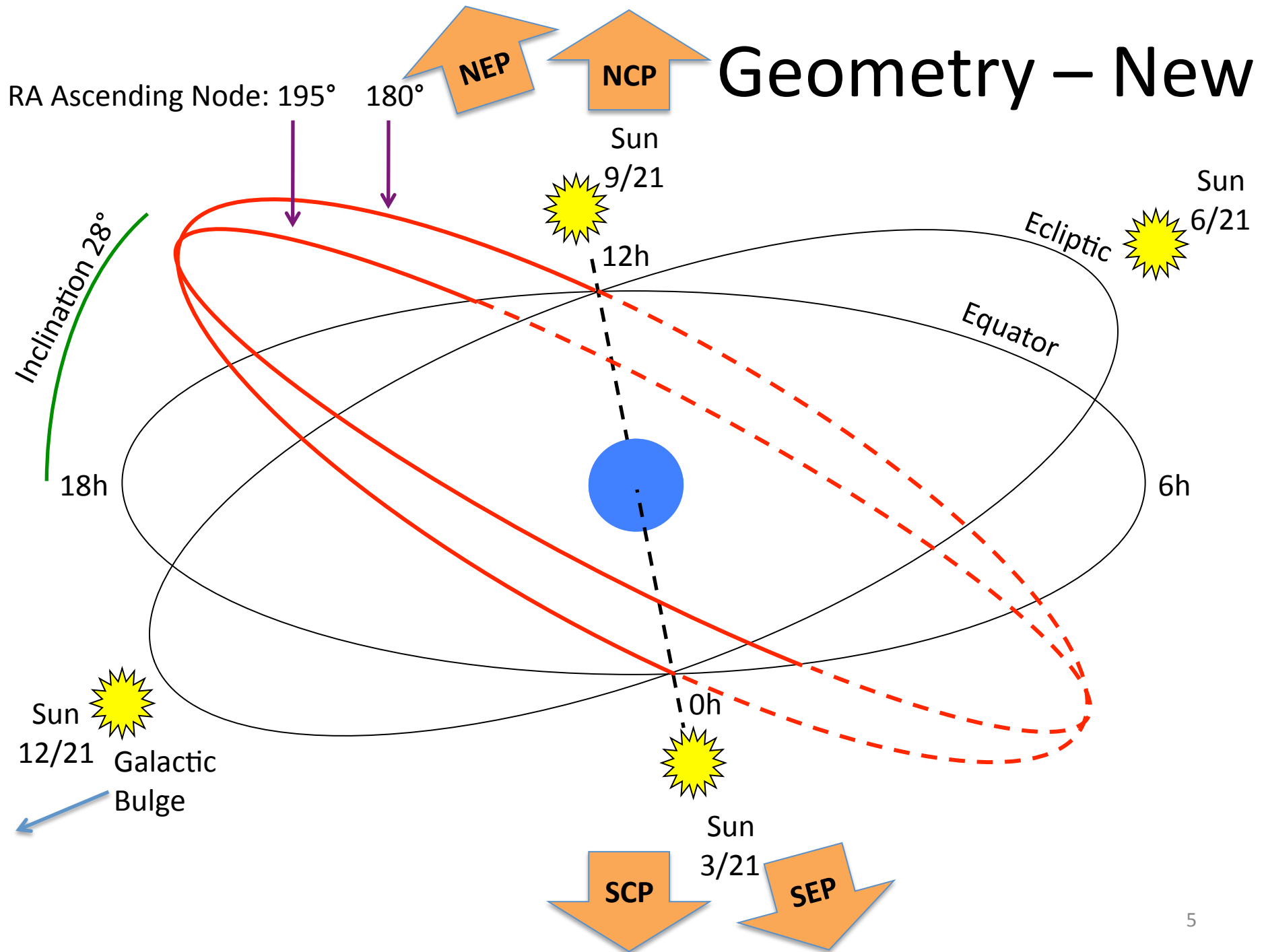
- This is a work in progress – trying to adiabatically modify the old concept into what we want for the report.
- SDT#2 consensus (updated on the last telecon?) was for:
 - Increased GO time (~30%?)
 - Count Galactic Plane as an example GO program.
 - 6 months for the supernovae, using IFU as baseline
 - Move HLS and SN fields to within the LSST footprint, if possible.
 - Will have to consider cases both with and without coronagraph
- Project requests:
 - Updated WFI parameters (field orientation, 2.5 mm gaps)
 - Reduce roll angle range if possible now that we have dropped prism approach to the SNe
 - Try to implement a constraint on the WFI radiator pointing relative to Earth

Current Status

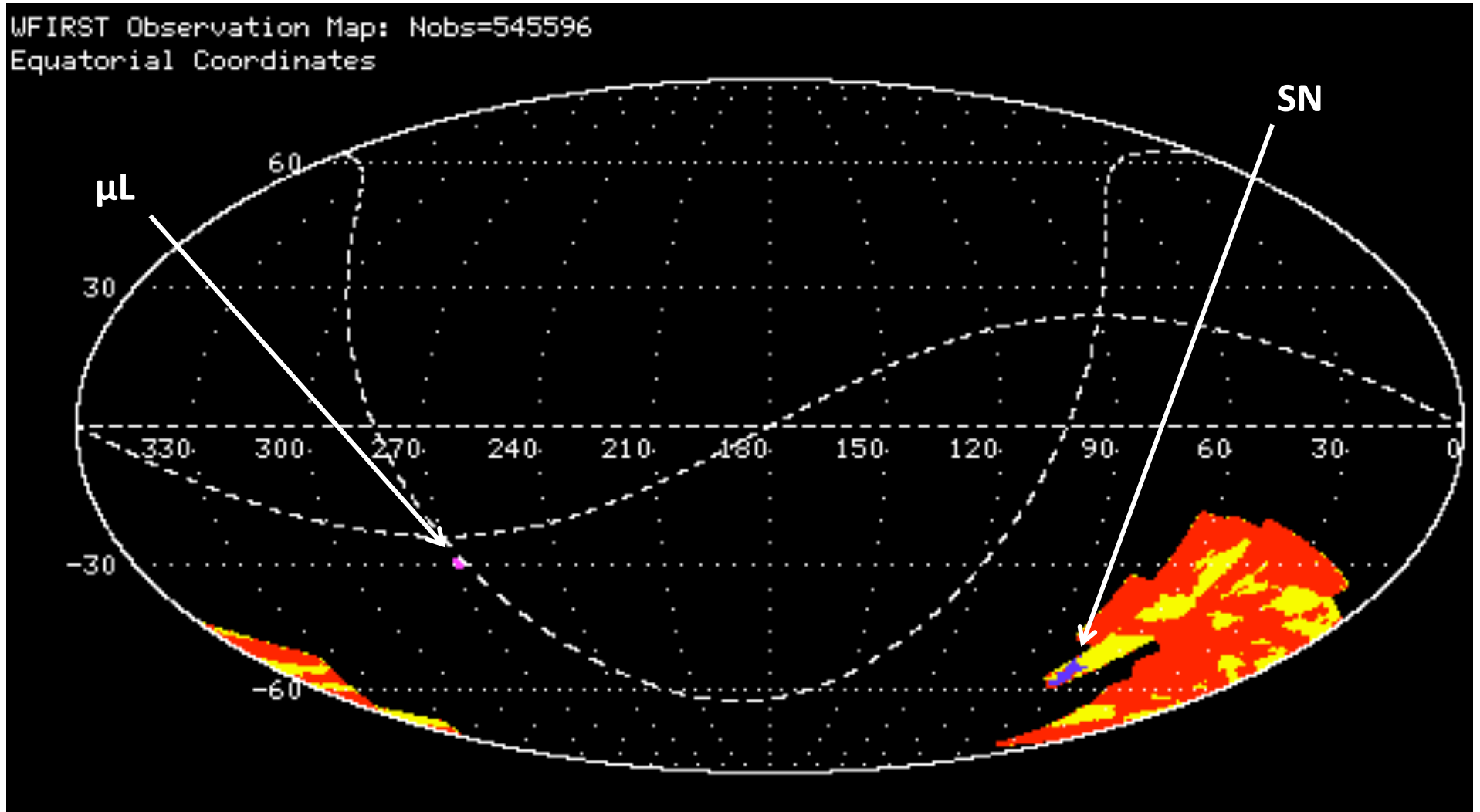
[And my assessment of where we are relative to where I wanted to be for the report.]

| | |
|---|--|
| ✓ | Move SN footprint to S Hemisphere: Done. (But LSST “deep drilling” fields not accessible year round from WFIRST due to Sun angle constraint.) Some daily cutouts occur but appear manageable. |
| ✓ | Move HLS footprint to S Hemisphere: Accomplished for ≥ 2000 deg ² . |
| ✓ | Roll angle reduction: Old $\pm 22.5^\circ$ range brought down to $\pm 15^\circ$, and can accommodate $\pm 10^\circ$ for observations at $< 90^\circ$ Sun angle. |
| ✓ | Radiator Earth avoidance angle: Implemented 28° cutout for inertial-fixed programs (μ lens + SN), significant further increases will be impossible without major changes to the mission architecture. Other programs accept a 47.5° cutout during observations (but still need to check slews between programs). Had to move initial RAAN down to 175° to accommodate this. |
| ½ | SN program duration: Including the overheads this overflowed to 236 days. Want to revisit in detail as part of IFU back-end trades. |
| ½ | Integrate coronagraph into scheduling plan: We have a first-look plan, further work requires understanding the “real” coronagraph constraints from output of thermal/optical model. Will put summary plots from first-look plan in report. |

Geometry – New

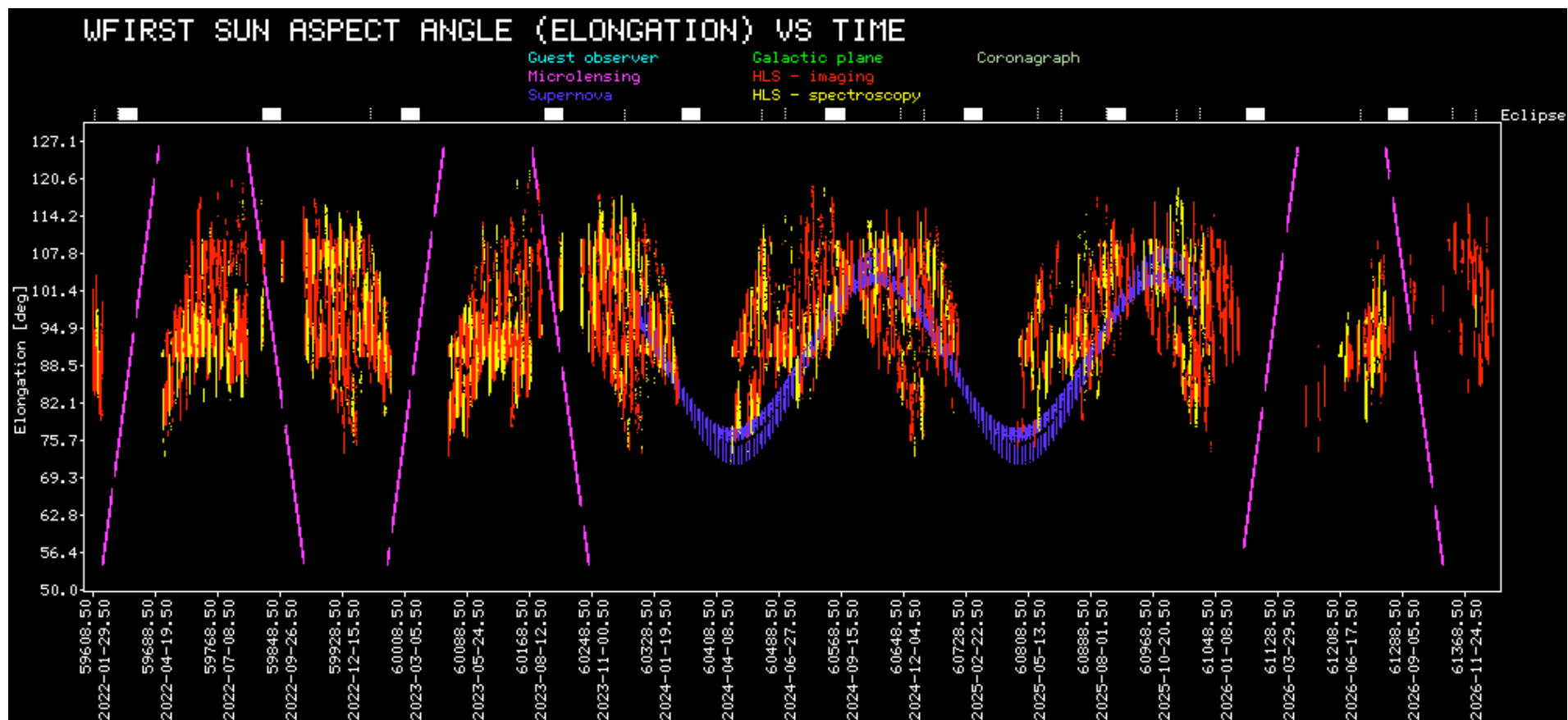


Survey Footprint

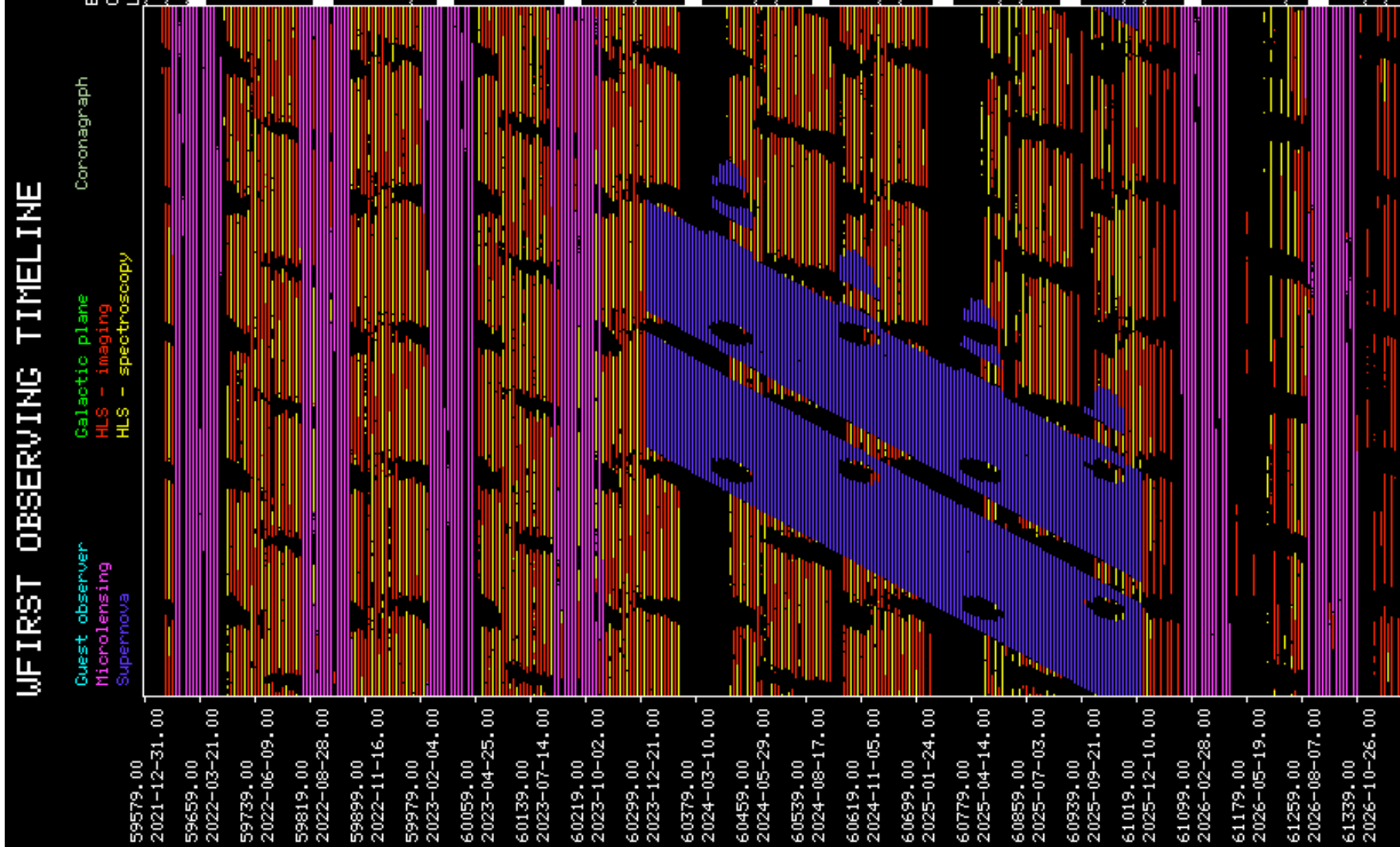


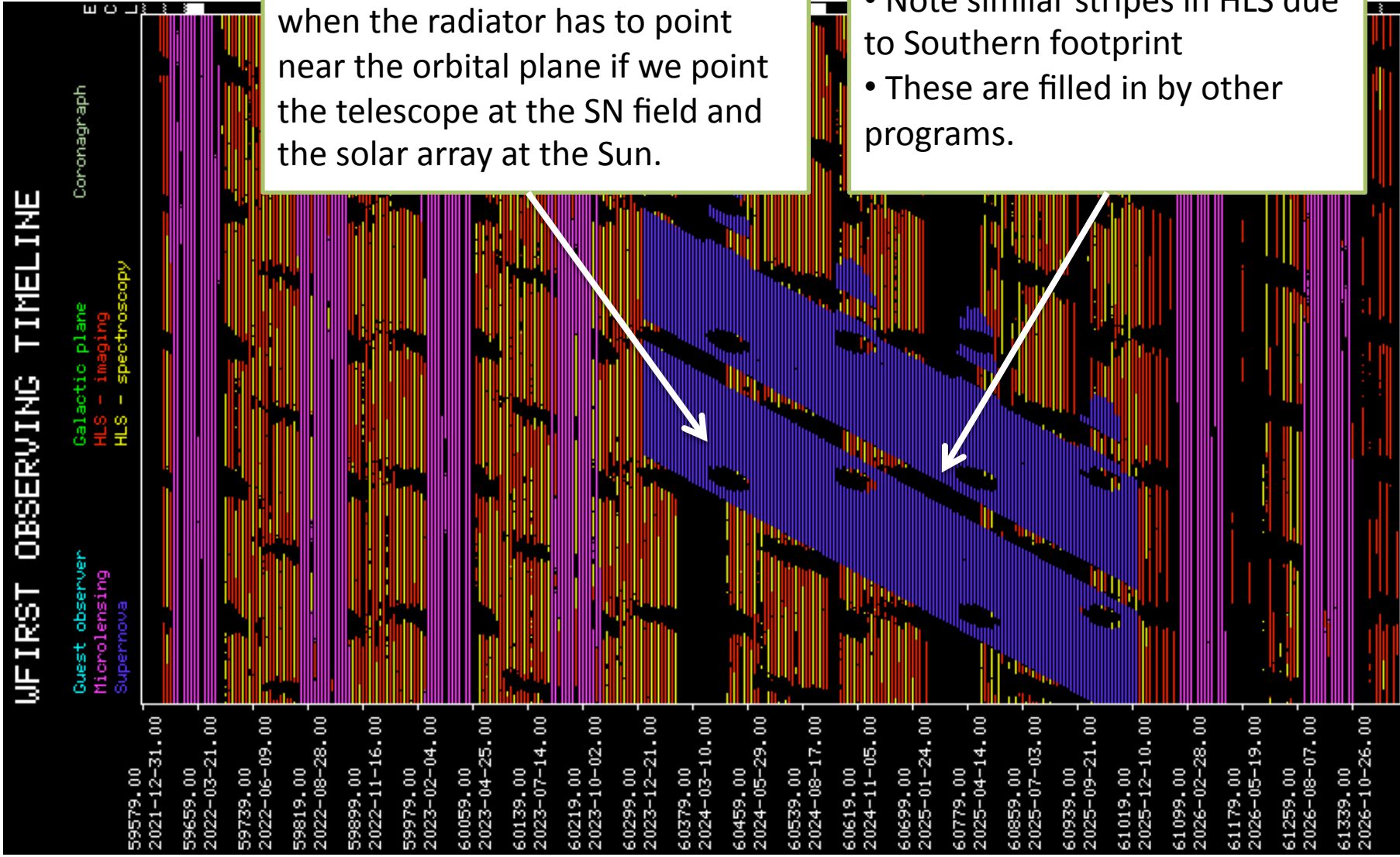
HLS in red/yellow (color denotes whether last observation was imaging or spectroscopy)

Sun Angle Chart



5 year plan – each column is 5 days long





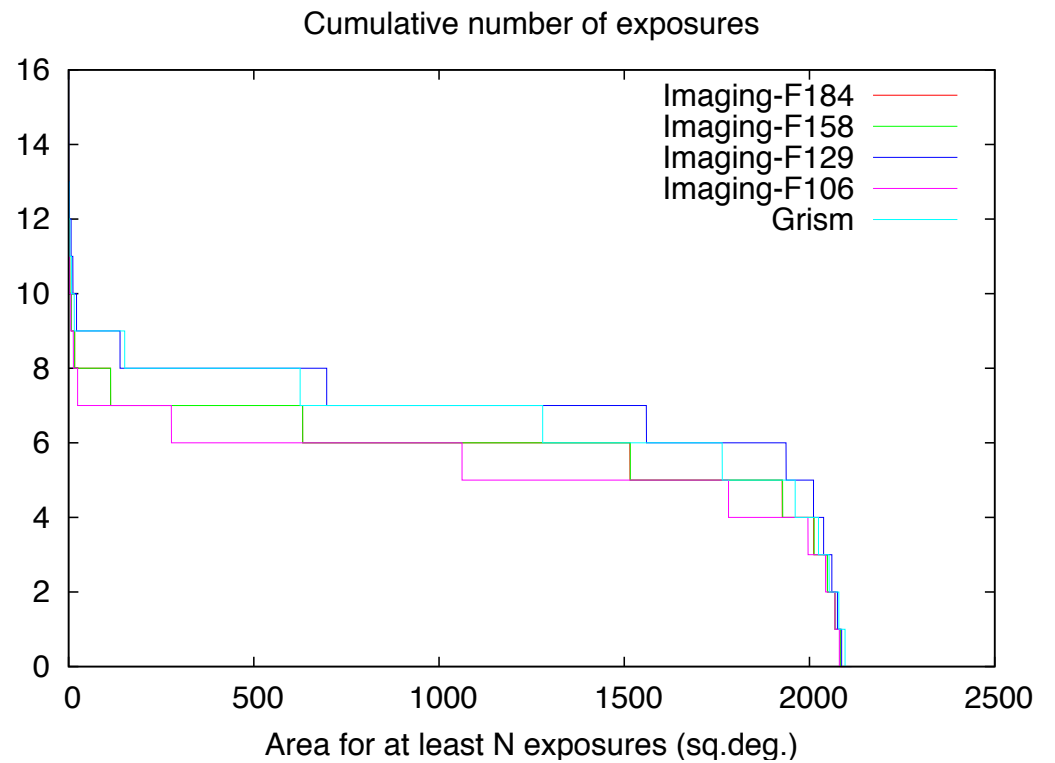
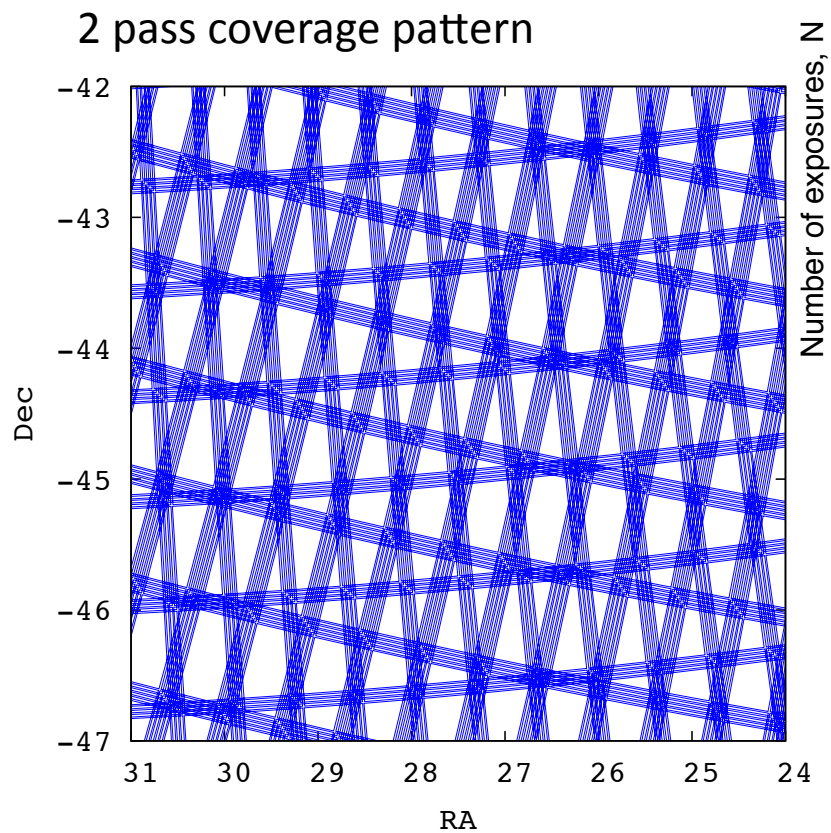
- Earth radiator cutouts (ellipses).
- Vary with spacecraft roll angle: there are daily cutouts during 2 seasons (~May & November) when the radiator has to point near the orbital plane if we point the telescope at the SN field and the solar array at the Sun.

- Earth telescope viewing cutouts (diagonal stripes – 4 min earlier each day)
- Note similar stripes in HLS due to Southern footprint
- These are filled in by other programs.

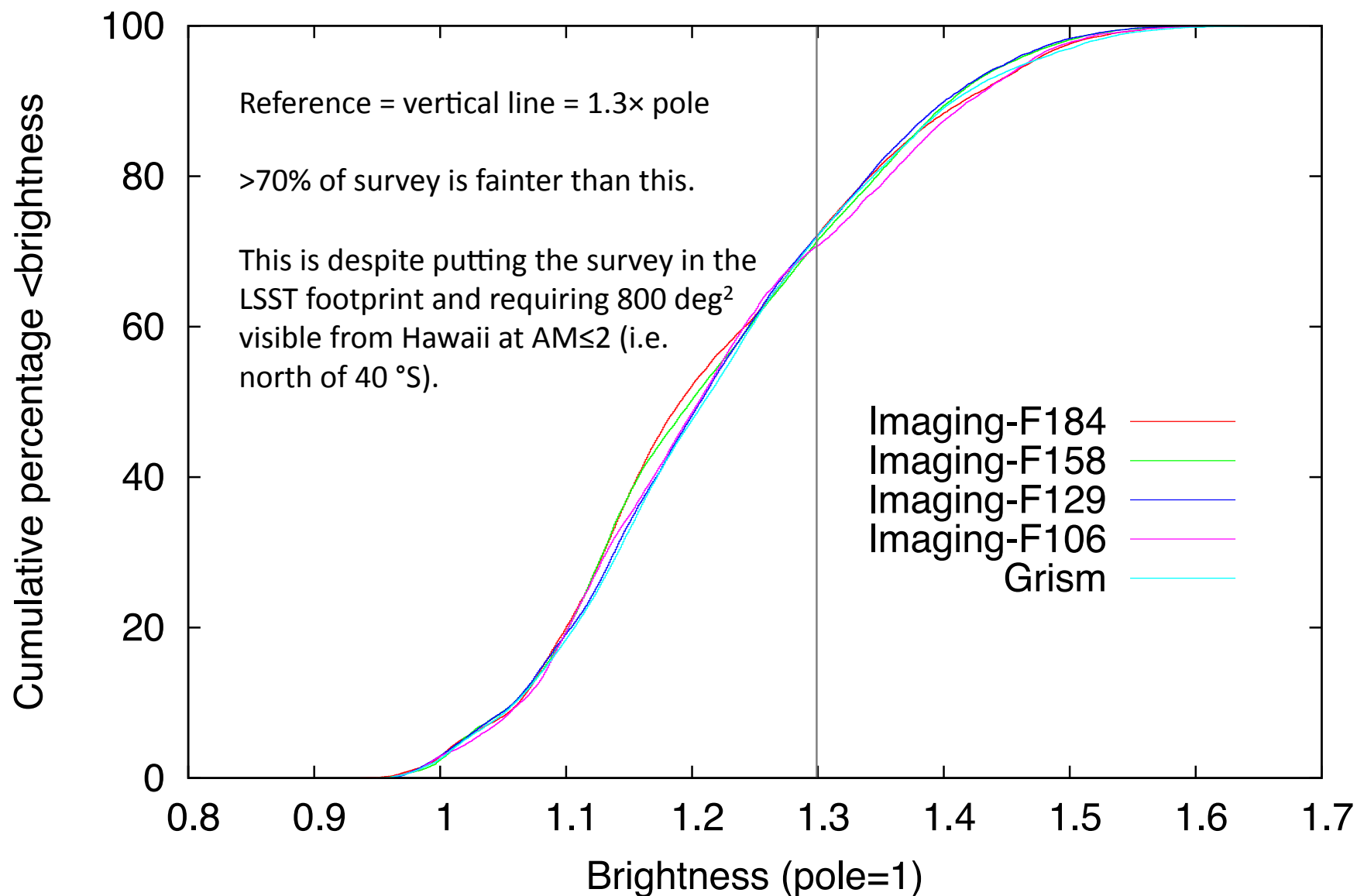
Current Time Breakdown

| | | |
|------------------------------|---|-----------------|
| # Number of observations | = | 545596 |
| # Science period start MJD | = | 59579.000000 |
| # Beginning of sequence MJD | = | 59608.500001 |
| # End of sequence MJD | = | 61405.247733 |
| # Science period end MJD | = | 61405.250000 |
| # Number of filter changes | = | 3171 |
| # | | |
| # Observing time breakdown: | | |
| # Microlensing | | 355.350154 days |
| # Supernova | | 236.000411 days |
| # High Latitude Imaging | | 451.728898 days |
| # High Latitude Spectroscopy | | 233.304693 days |
| # Coronagraph | | 0.000000 days |
| # Unallocated | | 525.312004 days |

HLS Coverage

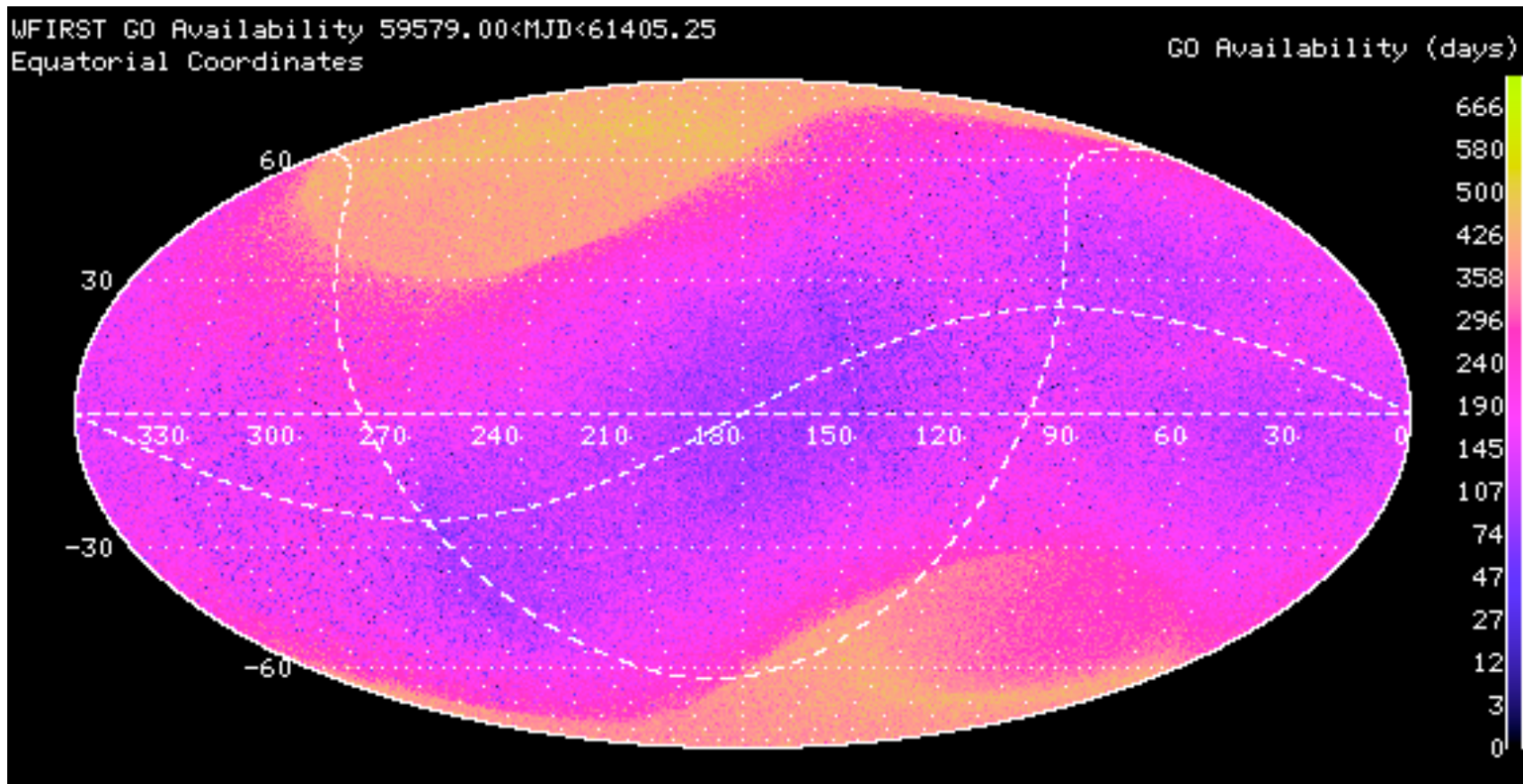


Sky Brightness



GO Program

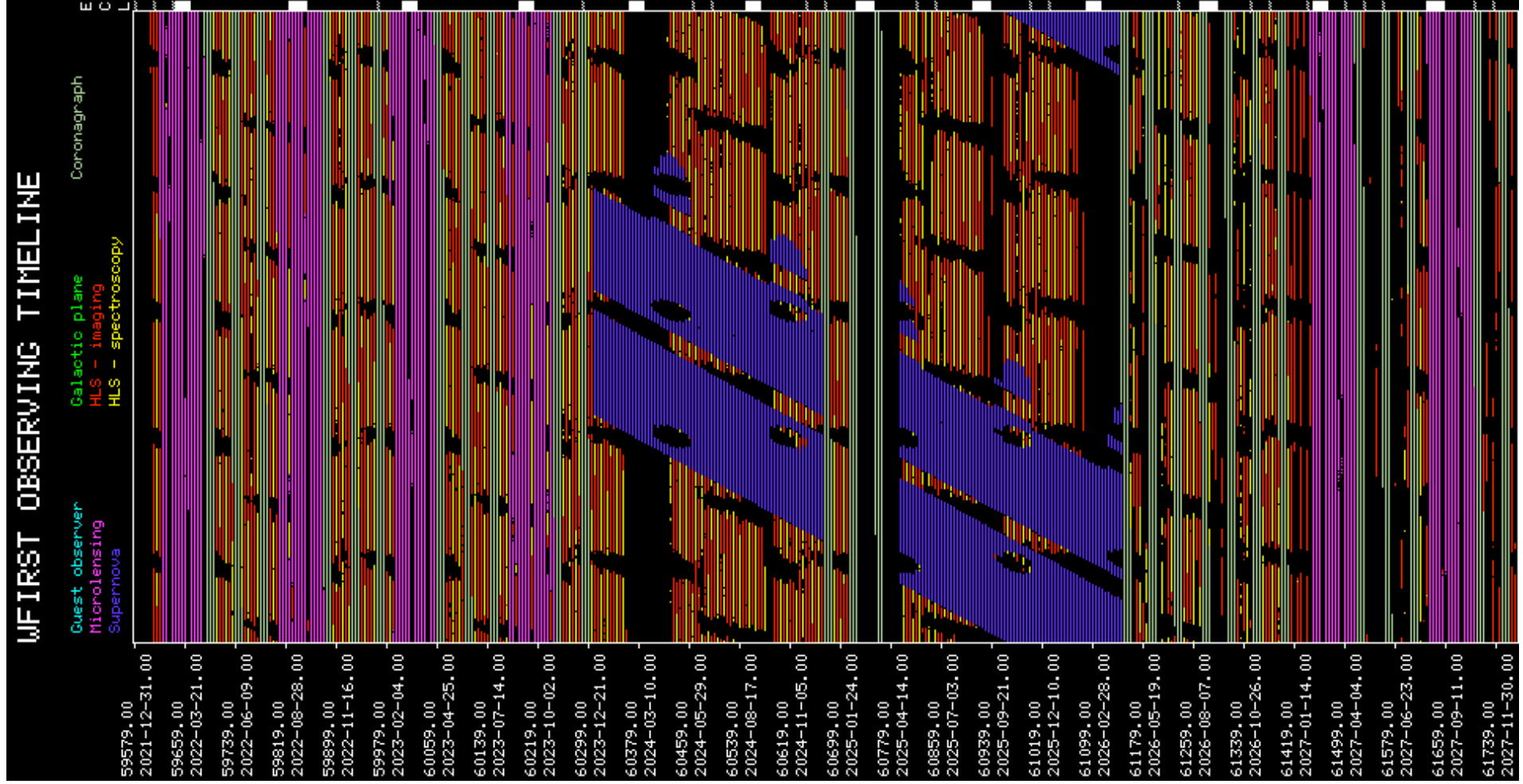
- Map of time available to view any part of the sky in a GO proposal without moving any other program
- This should be viewed as a minimum: the possibility of moving HLS observations would increase flexibility



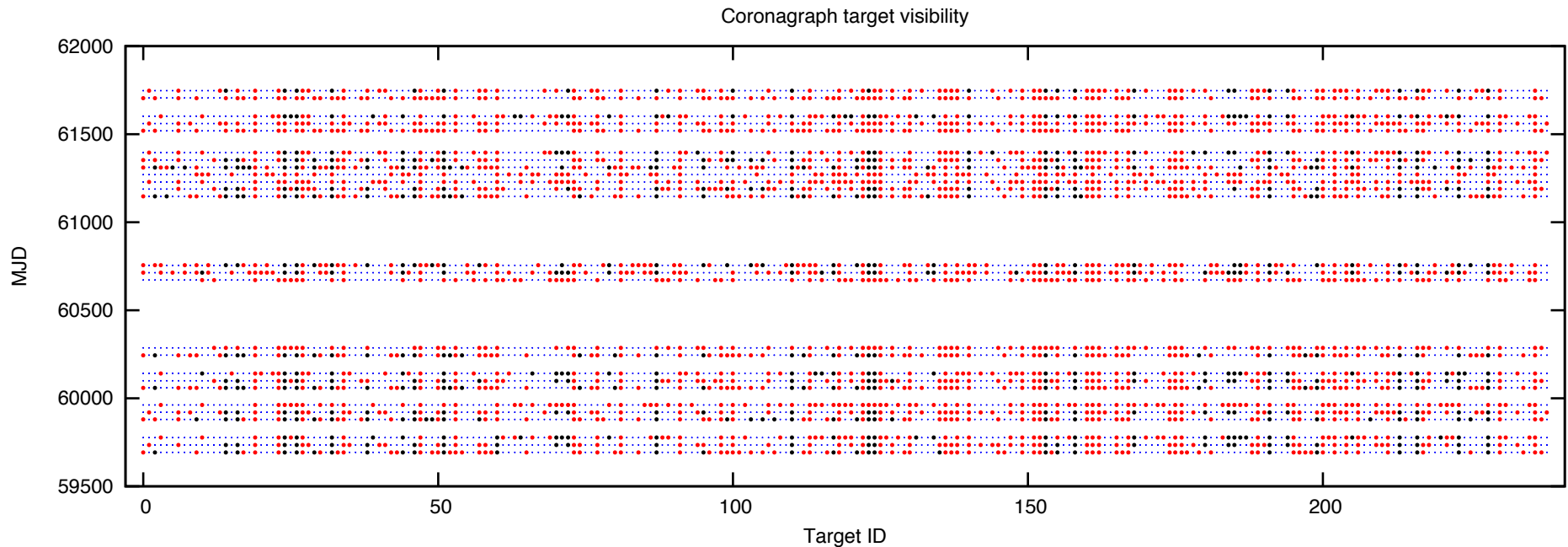
Coronagraph

- Uses 1 year of mission time out of 6 year mission.
- Currently broken into 26 “blocks” of 2 weeks each, dispersed throughout the mission.
 - The main difficulty of doing this is collisions on the SN program: notional plan splits SN into 2 chunks of 1 year each.
 - There may be alternate solutions.
 - With an IFU this is expected to not be a problem. (The slitless version suffers severe end effect losses; the IFU does not need to follow SNe whose light curve will be incomplete.)
- Within each block, assess observability of possible targets.
 - Drawn from catalog of 239 nearby stars of interest (D. Savransky).
 - Current WAG 30° limit on Earth limb exclusion angle – may be optimistic! Need to understand the “real” limit from thermal perturbation due to Earth shining into the barrel, will update constraints then.

6 Year Observing Plan



Target Visibility Chart



For each target and each 14-day block:

| | |
|----------|--------------------------------|
| Black | Continuously visible |
| Red | >78% visibility over the block |
| Blue dot | <78% visibility over the block |